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Learning and Teaching with Understanding by Design and Differentiated Instruction

A Project Presented to the Faculty of Sweet Briar College

In Partial Fulfillment of the Requirement for the Degree
Master of Education

By

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Abstract

Learning and Teaching with Understanding by Design and Differentiated Instruction by Marjorie Hamilton looks at the curriculum design model of backward design combined with differentiated instruction. This project poses the question whether the curriculum designed for a second grade social studies unit will increase understanding when the principles of backward design and differentiation are implemented. The three week unit included a six day direct instruction section and a nine day backward designed and differentiated section implemented in a second grade social studies unit. The study provides strong evidence that the combination of backward curriculum design integrating differentiated instruction enhances the deep understanding that is needed for students to become life long learners. The project is an initial study and more research is needed to establish firm evidence to generalize the finding to the general population.

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"Beset by lists of content standards and accompanying "high stakes" accountability tests, many educators sense that both teaching and learning have been redirected in ways that are potentially impoverishing for those who teach and those who learn. There seems a need for a model that acknowledges the centrality of standards, but also demonstrates how meaning and understanding can both emanate from and frame content standards so that young people develop powers of mind as well as accumulating an information base. For many educators, "Understanding by Design" addresses that need.

Simultaneously, teachers find it increasingly difficult to ignore the diversity of learners who populate their classrooms. Culture, race, language, economics, gender, experience, motivation to achieve, disability, advanced ability, student interest, learning preferences, and presence or absence of an adult support system are just a few of the factors students bring to school with them in almost stunning variety. Few teachers find their work effective or satisfying when they simply "serve up" a curriculum-even an elegant one-to their students with no regard for their varied learning needs. For many educators, "Differentiated Instruction" offers a framework for addressing learner variance as a critical component of instructional planning."

(Integrating Differentiated Instruction +Understanding by Design Connecting Content and Kids by Carol Ann Tomlinson and Jay McTighe)

CHAPTER ONE

BACKGROUND

Introduction

Grant Wiggins and Jay McTighe have combined their theory of Understanding by Design with Carol Ann Tomlinson's theory of Differentiated Instruction to create what they feel is a powerful teaching and learning tool. For all students to be successful in the learning environment, they must experience deep understanding and have the opportunity to learn in a variety of ways to achieve that deep understanding. Understanding by Design is a program that provides educators with guidelines for redesigning curricula to make significant student understanding possible. Wiggins and McTighe believe that these changes can be accomplished through backward design of curriculum which is a learning sequence that strives for deeper understanding by students.

Tomlinson believes that to reach every student you must attend to student differences in readiness, interest, and learning styles. Once the student's learning preference is established, lessons are created to accommodate the student's readiness level and/or learning style preference. Curriculum is challenging and respectful for all learners. In combining these two models, the designers want to create new opportunities for deep understanding and life long learners and avoid an environment that emphasizes rote learning rather than exploration.

Thesis Question

Will curriculum designed for a second grade social studies unit increase understanding when the principles of backward design and differentiation are implemented?

Assumptions

The following assumptions were made regarding the thesis and sample projects:

1. Understanding by Design is a strong teaching tool.
2. The instructor has a basic knowledge of backward design which is incorporated in the Understanding by Design model.
3. Differentiated Instruction is a strong teaching tool.
4. The instructor has a basic knowledge of differentiating instruction to accommodate readiness levels, learning profiles, and interest.
5. The instructor has basic knowledge of authentic assessment and implementation of rubrics.

Purpose of the Thesis

The goal of this thesis is to determine if the method of Understanding by Design combined with Differentiated Instruction will provide teachers with a valuable teaching tool that will increase student success through understanding by students. The model is based on the theory that skill and understanding are vital to success. This is a shift from the old theory of student skill and drill to the new theory of student understanding and application. Jay McTighe and Elliot Seif state the guidelines that Understanding by Design is based on in *A Summary of Underlying Theory and Research Base for Understanding by Design* (2003). The most important goal is to expand and deepen student understanding. The student's understanding should be observed through application with use in authentic contexts. The curriculum to achieve student understanding is developed through a three-stage process called "backward design". This backward design starts the process of planning curriculum with the standard or outcome that is to be achieved. Planning curriculum in this format avoids the problems of mere textbook coverage and activity oriented teaching that shows no clear direction or purpose. With backward design, both teacher and student are provided with the opportunity to review the curriculum and assess design throughout the process of learning. They describe this as "quality control" to avoid design mistakes and disappointing results. The curriculum is reviewed continuously and related to review as a form of action research to adjust the curriculum for maximum student achievement and growth. Teachers use what Wiggins and McTighe have named the conceptual lens which leads students to focus and study in depth to establish enduring understanding of

the subject matter. Wiggins and McTighe have further classified understanding in six facets which include the ability to explain, interpret, apply, shift perspective, empathize, and self-assess. The last guideline is to work smarter, not harder. Teachers and schools can do this by collaborating on the design, sharing, and critiquing units of study.

Now Jay McTighe has joined with Carol Ann Tomlinson to add the model of Differentiated Instruction (DI) to strengthen understanding of all students. DI was developed originally because of the concern that gifted/talented students were not being challenged in a mixed-ability classroom. The program was created to provide more challenging and respectful class work for gifted and talented students. The concept has progressed to reach all areas of the mixed ability classroom because educators are faced with students that come to them with such a wide varying degree of background knowledge, readiness, language, preferences in learning, interests, and educators are reacting responsibly to provide what the students need to be successful. Success is defined here as moving the student to his/her "zone of proximal development" through scaffolding. When independence is achieved, the students are moved on to the next challenge. Since students learn at different paces and with different learning styles, curriculum is adjusted to the needs of the student. Differentiated instruction is based on the components of content, process and product. Content consists of facts, concepts, generalizations or principles, attitudes, and skills related to the subject. Several elements and materials are used to support instructional content. The variation of content seen in a differentiated classroom is most frequently the manner in which students gain access to important learning. Objectives are frequently written in incremental steps

resulting in a continuum of skill-building tasks. Goals are most frequently assessed by standards tests from the state level. Instruction is concept-focused and principle-driven. Concepts should be addressed with all students but be adjusted by degree of complexity to the varying student needs. Process is how the learner comes to make sense of, understand, and "own" the key facts, concepts, generalizations, and skills of the subject. Flexible grouping is consistently used, groups are not fixed. They are based on content, process, and on-going assessments. Grouping becomes a dynamic process based on student understanding of content, process, and product. When students are engaged, in a differentiated classroom, it leads to an organized and easily managed classroom. Classroom management benefits students and teachers.

Product refer to the items a student can use to demonstrate what he or she has come to know, understand, and be able to do as the result of an extended period of study. Initial and on-going assessment of student readiness and growth is essential. Pre-assessment leads to functional, successful, engaging planning and learning. On-going assessment informs teachers to better provide a menu of approaches, choices, and scaffolds for the varying needs, interests, and readiness levels. Students are active and responsible explorers, with varied expectations for student responses.

The guidelines to differentiate instruction include clarifying key concepts and generalizations, using assessment as a teaching tool to extend not just measure instruction, emphasizing critical and creative thinking, engaging all learners is essential, and providing a balance between teacher-assigned and student selected tasks. (*Effective Classroom Practices Report,* National Council on Assessing the General Curriculum, 2002)

Significance of the Problem

We are in an era of teaching curriculum based on standards and high stakes state-mandated assessment. This approach has pushed teachers to "cover" the vast quantity of material that the state mandates. Little significance is given to conceptual understanding or quality assessment. The theory of Understanding by Design works with state-mandated standards "... to help us identify teaching and learning priorities and guide our design of curriculum... we also consider the needs of our students when designing learning experiences." (Grant Wiggins and Jay McTighe 1998). Students need to understand the importance of what they are learning and make connections to real life situations to remain engaged in learning. Differentiated instruction "is a conceptual approach to teaching and learning that involves careful analysis of learning goals, continual assessment of student needs, and instructional modifications in response to data about readiness levels, interests, learning profiles, and affects" (Carol Ann Tomlinson, 2003)
Jay McTighe and Carol Ann Tomlinson have joined forces to combine these two models and explain many advantages to this combination of theories. They say:

> "If we had at our grasp the most elegant curriculum in the world and it missed the mark for students with learning disabilities, highly advanced learners, students with limited English proficiency, young people who lack economic support, kids who struggle to read, and a whole host of others, the curriculum would fall short of its purpose.

> On the other hand, if we were the effective disciples of flexible grouping, interest-based instruction, responsive environments, and a host of instruction strategies that allow us to attend to learner variance but employed those approaches in the absence of a powerful curriculum, our classrooms would miss the mark of equipping students with the ideas and skills necessary to make their way in the world.
>
> Simply put, quality classrooms evolve around powerful knowledge that works for each student. That is, they require quality curriculum and quality instruction. In tandem, UBD and DI provide structures, tools, and guidance for developing curriculum and instruction based on our current best understandings of teaching and learning".

(*Integrating Differentiated Instruction + Understanding by Design, Connection Content and Kids* by Carol Ann Tomlinson and Jay McTighe 2006) Teaching students in this method should offer success for all students. It should reduce the number of student who find learning a struggle or simply drop out of school.

Definitions

Six Facets of Understanding:

Explanation: sophisticated and apt explanations and theories, which provide knowledgeable and justified accounts of events, actions, and ideas. To ensure students understand why an answer or approach is the right one. Students explain or justify their responses or justify their course of action.

Interpretation: interpretations, narratives, and translations that provide meaning. To ensure students avoid the pitfall of looking for the "right answer" and demand answers that are principled students are able to encompass as many salient facts and points of view as possible.

Application: ability to use knowledge effectively in new situations and diverse contexts. To ensure students' key performances are conscious and explicit reflection, self-assessment and self-adjustment, with reasoning made evident. Authentic assessment requires a real or simulated audience, purpose, setting, and options for personalizing the work, realistic constraints, and "background noise."

Perspective: critical and insightful points of view. To ensure students know the importance or significance of an idea and to grasp its importance or unimportance. Encourage students to step back and ask, "What of it?", "Of what value is this knowledge?", "How important is this idea?", and "What does this idea enable us to do that is important?"

Empathy: the ability to get inside another person's feelings and worldview. To ensure students develop the ability to see the world from different viewpoints in order to understand the diversity of thought and feeling in the world.

Self-Knowledge: the wisdom to know one's ignorance and how one's patterns of thought and action inform as well as prejudice understanding. To ensure students are deeply aware of the boundaries of their own and others' understanding; able to recognize their own prejudices and projections; has integrity – able and willing to

act on what one understands. (Wiggins, G., & McTighe, J. (1998). *Understanding by Design* p. 85-97.) See Appendix A Table 1

Big Ideas-this term is sometimes used as a synonym for a generalization. It refers to the key understandings a student should derive from a lesson or unit. It is a statement of truth about a concept which transfers across events, times, and cultures.

Essential Questions-questions based on the big idea to be answered throughout a lesson or unit.

Rubric-a tool that guides the evaluation of student works and clarify student understanding of expectations for quality work. In addition, a rubric describes how various levels of quality in each of the designed categories would look.

WHERE-an acronym that stands for where are we headed, hook the students, explore the subject, reflect, rethink, rehearse, revise, refine work based on feedback and self-assessment, and evaluate results.

Scaffolds-is any support or process that helps a person solve a problem or achieve a goal which would be beyond their unassisted efforts

Performance of Understanding-activities that require students to use knowledge in new ways or situations and helps students build as well as demonstrate their understanding.

GRASPS-an acronym used to frame assessment tasks, a real-world goal, a meaningful role for the student, authentic audiences, a contextualized situation that involve real-world application, student-generated culminating products and performances, and consensus-driven performance standards for judging success

CHAPTER TWO

REVIEW OF THE LITERATURE

Introduction

We move into the twenty first century with the emphasis in education on accountability. Under the federal No Child Left Behind Act of 2001, standardized test scores is the indicator used to hold schools accountable for student achievement. States have created standards for learning that all teachers must teach and all students must learn. The end of the year brings a standards-based test in a multiple choice format to evaluate achievement. This format tests simple recall of information and in many cases has driven teachers to tailor their instruction to the assessment, better known as teaching to the test. These measurements tend to isolate assessment tasks from ongoing instruction. It can lessen the role of the classroom instructor and give favor to the students who can recall or recognize information. Assessment should be a direct window for instruction, not "a snapshot" through a single assessment. When a single assessment is used, often the incentive to learn is diminished to recalling information, not understanding. The curriculum should support understanding based teaching and learning. Days are gone where the textbook is the only source used to teach a curriculum with success. It can be one primary source for student learning but not the only one to meet the needs of all students. There must be a diversity of materials and methods of teaching to meet the needs of the diverse student population with the wide range of abilities, interests, and learning styles found in every classroom.

In standards-based education, it is assumed that students come to a grade with prior subject matter knowledge and new information is to be presented that can build upon this prior knowledge. This is not always true and allowances for learners who lack knowledge or have misinformation is not taken into consideration. Students need time to generate connections to prior learning, to generate insights and understandings about their learning. They also must be challenged at their proper level of difficulty to remain motivated. Tasks that are too easy become boring, tasks that are too hard cause frustration. Through scaffolding or a support system for learners, they can be challenged without frustration. Students are more motivated to learn when they see the usefulness of what they are learning. Proper curriculum development can provide the motivation, connections to prior knowledge, and understanding that learners need to succeed in the learning environment. (*Integrating Differentiated Instruction + Understanding by Design: Connecting Content and Kids,* Carol Ann Tomlinson, Jay McTighe, 2006)

Jay McTighe, and Carol Ann Tomlinson disclose how the design models of Understanding by Design, (UbD) and Differentiated Instruction, (DI) work together to provide quality education, "In tandem UbD and DI provide structures, tools, and guidance for developing curriculum and instruction based on our current best understanding of teaching and learning" (Tomlinson & McTighe, 2006, p.3). These two models work together to the same goals that work toward powerful learning. To show the interrelated characteristics of the two models McTighe and Tomlinson have shown how the two theories blend. The primary goal of UbD is to develop and deepen student understanding. DI subsequently works for all students to benefit

from a curriculum that develops and deepens their understanding. Given variance in student ability, experience, opportunity, language, interest, and support, they will grow at different rates and require varied support systems to develop and deepen their understanding.

As stated by Carol Ann and Jay McTighe in *Integrating Differentiated Instruction + Understanding by Design: Connecting Content and Kids,*, the authors site axioms and corollaries that show DI and UbD are not just compatible but also complimentary. The following is how Tomlinson and McTighe show how the two models interface.

Evidence of student understanding is revealed when students apply knowledge in authentic contexts. Such application will reveal varying degrees of proficiency and sophistication in student's knowledge, understanding, and skill. The most effective teachers use the evidence to provide opportunities and support to ensure that each student continues to develop and deepen knowledge, understanding, and skill from his/her current proficiency.

Curriculum development that follows the principles of backward design helps teachers to avoid the twin problems of textbook coverage and activity-oriented teaching in which no clear priorities and purpose are apparent.

Struggling learners require focus on the truly essential knowledge, understanding, and skill of a unit to ensure that their efforts are most efficient and potent in moving them forward in reliable ways. Advanced learners need challenge predicated on what is essential in a discipline so that their time is accorded value and their strengths are developed in ways that move them toward expertise. Regular reviews of curriculum and assessment designs, based on design standards, are needed for quality control to avoid design mistakes and disappointing results. A key part of a teacher's job is

ongoing action research for continuous improvement. Results of reviews at school and class levels should be followed by targeted adjustments to curriculum and instruction. Results will inevitably show variation among students in knowledge, understanding, and skill. Results-based adjustments to curriculum and instruction should be targeted to the individual level as well as the class level. Results-based adjustments will inevitably require flexible use of time, teacher attention, materials, groupings, and other classroom elements to ensure continued deepening of students' understanding. Teachers provide opportunities for students to explain, interpret, apply, shift perspective, empathize, and self assess. These six facets provide conceptual lenses through which students reveal their understanding. All students should be guided in thinking in complex ways. It is NOT the case that struggling learners must "master the basics" before they can engage in thinking. Evidence clearly suggests that for most student, mastery and understanding come through, not after, meaningful interaction with ideas. Nonetheless, students will differ in the level of sophistication of their thinking and understanding. Teachers should be prepared to provide opportunity and support to continually develop students' understanding and capabilities as thinkers. Teachers, students, and districts benefit by "working smarter" and using technology and other opportunities to collaboratively design, share, and critique units of study. A routine part of collaboration in academically diverse classrooms should occur between classroom teachers and specialists who have expert knowledge of a range of student needs and instructional approaches most likely to respond effectively to those needs (*Integrating Differentiated Instruction*

+*Understanding by Design,* Carol Ann Tomlinson and Jay McTighe, 2006, p4-10).

UbD is a way of thinking - not a program. Educators adapt its tools and materials with the goal of better promoting understanding. Differentiated instruction is a way of thinking - not a formula. Educators draw on, apply, and adapt its tools with the goal of maximizing the knowledge, understanding, and skill of the full range of learners. Successful differentiation guides educators in thinking effectively about who they teach, where they teach, and how they teach, with the goal of ensuring that what they teach provides each student with maximum power as a learner. (*Understanding by Design and Differentiated Instruction,* Jay McTighe, Carol Tomlinson, and Grant Wiggins, ASCD Conference, 2004)

The framework of backward design and differentiating instruction focuses on student understanding and quality assessment to adjust instruction to meet all students' needs. "Backward" refers to a design process that begins with the product of the learning, thinking in reverse order to identify the knowledge and skills needed to develop the desired product (Appendix B, Tables1-3). The assessment data is used to plan and adjust instruction, thus students are all working toward success. Teachers facilitate learning by providing students with important feedback on their learning progress and by helping the learner identify learning problems. (Bloom, Madaus, & Hastings, 1981; Stiggins, 2002)

Teachers use assessment tools such as quizzes, tests, and writing assignments because they trust their results which are immediate and easy

to analyze. Too often teachers wait until the instruction is complete to assess what the students have learned so they can assign a grade (Guskey, 2003). Assessment should not mark the end of learning but the continuum of what the students' degree of understanding or misunderstanding is, so the teacher can plan what understandings have or have not been met. With differentiating instruction all needs are met at the correct level of understanding and scaffolded to the next level. "Assessments can help improve education, but as long as we use them only as means to rank schools and students, we will miss their most powerful benefits" (Guskey, 2003).

Research

How People Learn: Brain, Mind, Experience, and School (Bradford, Brown, and Cocking, 2002) published by the National Research Council examine how people learn and what should be included in good teaching methods. The researchers looked at experts in many areas of learning to find what characteristics they acquired to become experts. They then generalized this information to give an overview of what key principles were needed to become an expert and their implications for learning and instruction. One conclusion brought forth from the study is that experts develop an understanding of a problem through thinking in terms of core concepts or big ideas. Novices think in terms of formulas or pat answers that fit a new situation or problem. To become an expert the level of complexity must be based on the learner's current level of knowledge and skill. A text book does not offer a variety of entry points and is often filled with facts that do not show importance of information, just isolated facts about a subject. This style of learning prohibits the showing of the usefulness of the information

to the learner which leads the learner to memorization of isolated facts. They conclude, "Traditional education has tended to emphasize memorization and mastery of text. Research on the development of expertise, however, indicates that more than a set of general problem-solving skills or memory for and array of facts is necessary to achieve deep understanding" (p. 239). In *A Summary of Underlying Theory and Research Base for Understanding by Design* (Jay McTighe and Elliot Self, 2003) the authors relate the relationship of research to the contemporary based view of learning based on cognitive psychology. They sight the relationship of UbD to specific studies. The first research relationships are from *How People Learn: Brain, Mind, Experience, and School* (Bradford, Brown, and Cocking 2002). This publication summarizes the past thirty years of research in learning and cognition. McTighe and Self list the following key findings as relevant to UbD:

- Views on effective learning have shifted from a focus on the benefits of diligent drill and practice to a focus on students' understanding and application of knowledge.
- Learning must be guided by generalized principles in order to be widely applicable. Knowledge learned at the level of rote memory rarely transfers; transfer most likely occurs then the learner knows and understands underlying concepts and principles that can be applied to problems in new contexts. Learning with understanding is more likely to promote transfer than simply memorizing information from a text or a lecture.
- Experts first seek to develop an understanding of problems, and this often involves thinking in terms of core concepts or big ideas. Novices

are more likely to approach problems by searching for correct formulas and pat answers than fit their everyday intuitions.

- Research on expertise suggests that superficial coverage of many topics in a domain may be a poor way to help students develop the competencies that will prepare them for future learning and work. Curricula that emphasize breadth of knowledge may prevent effective organization or knowledge because there is not enough time to learn anything in depth. Curricula that are "a mile wide and an inch deep" run the risk of developing disconnected rather than connected knowledge.
- Feedback is fundamental to learning, but feedback opportunities are often scarce in classrooms. Students may receive grades on tests and essays, but these are summative assessments that occur at the end of projects. What are needed are formative assessments, which provide students with opportunities to revise and improve the quality of their thinking and understanding.
- Many assessments measure only propositional (factual) knowledge and never ask students whether students know *when, where,* and *why* to use that knowledge... Given the goal of learning with understanding, assessment and feedback must focus on understanding, and not only on memory for procedures or facts.
- Expert teachers know the structure of their disciplines and this provides them with cognitive roadmaps that guide the assignments they give students, the assessments they use to gauge student progress, and the questions they ask in the give and take of classroom life... The misconception is that teaching consists only of a set of general methods that a good teacher can teach any subject, and that

content knowledge alone is sufficient (*A Summary of Underlying Theory and Research Base for Understanding by Design,* Jay McTighe and Elliot Self, 2003).

The second study that McTighe and Self relate to UbD was done with over 10,000 Chicago school students in grades 2-8 and 5,000 teachers. They showed evidence that student learning increased with the use of interactive teaching. The methods used increased understanding and parallel methods supported by UbD. (Smith, Lee, and Newman, 2001)

A related study concluded that all students benefited from authentic intellectual work that involves original application. Students showed a substantial gain in standardized and conventional testing (Newman, Bryk, and Nagaoka, 2001). Again, authentic tasks correspond with the UbD planning model.

The third study noted was the 1995 TIMSS study which showed that the countries that demonstrated success in student achievement based their teaching and learning on the main focus of UbD which is to emphasize problem-based learning. TIMSS also showed that higher achieving countries promoted understanding rather than coverage of a large number of isolated facts.

The fourth study reviewed was conducted with High Schools That Work (HSTW) which used the elements of UbD by way of a challenging curriculum, teaching for understanding, teaching in a meaningful context, and setting clear performance standards which integrated vocational and academic education. "...one study over a two-year period found that High Schools That Work sites significantly increased percentages of students in their senior classes who met the HSTW achievement goals in mathematics, science, and

reading and the percentage of students in their senior classes who completed the HSTW-recommended program of study" (Frome, 2001).

The fifth research study sited to parallel UbD is from the National Council of Teachers of Mathematics (NCTM). This study supported a performance based curriculum with understanding and was conducted with many elementary, middle, and high school students. Findings from the study showed that performance-based curriculum "...offers overwhelming evidence that the reform curriculum can have a positive impact on high school mathematics achievement. It is not that students in these curricula learn traditional content better but that they develop other skills and understanding while not falling behind on traditional content. These evaluations present more solid scientific evidence than has ever before been available about the impact of curriculum materials" (Senk & Thompson, 2003, p. 468).

McTighe and Seif go on to show research that supports specific teaching strategies such as advance organizers, higher order questioning, and feedback, They site Marzano, Pickering, and Pollock (2001) whose research showed that learning strategies affect student achievement and help students make the connections needed for understanding.

While UbD is a way to plan curriculum, Differentiated Instruction is responsible teaching where teachers react to students' needs. If curriculum is not planned with student needs in mind, even the best curriculum plan will not reach all students. Students learn at different readiness levels and have different interests and learning styles. These elements have been researched for a number of years and the findings all show that consideration of these three elements will motivate learners and learning.

Vygotsky established a "zone of proximal development" which is the zone where students cannot function independently with success; they must have support or scaffolding to advance (Vygotsky, 1962, 1978). With differentiated instruction, the support is present to move the student on to a higher level. "Instruction should always "be in advance" of a child's current level of mastery. That is, teachers should teach within a child's zone of proximal development. If material is presented at or below the mastery level, there will be no growth. If presented well above the zone, children will be confused and frustrated, (Byrnes, 1996) Scaffolding is one of the main components when differentiating instruction at a readiness level.

Student interest has been studied by many researchers for many years and they have concluded that it plays a major role in student success. "Interest based study linked to motivation and appears to promote positive impacts on learning in both short and long term (Herbert, 1993; Renninger, 1990, 1998; Tobias, 1994). Modifying instruction to draw on student interest is also supported by theory and research as a means of enhancing motivation, productivity, and achievement (Amabile, 1996; Torrance, 1995)" (Tomlinson, Brighton, Hertberg, Callahan, Moon, Brimijoin, Conover, & Reynolds, 2003).

The third element to be considered is learning style which is the student's preferred mode of learning and/or thinking styles and can be determined through a learning styles inventory assessment. "...research suggests that there are achievement benefits to addressing intelligence or thinking preference during the learning process, even if a final assessment is not in a learner's preferred mode," (Grigerenko & Sternberg, 1997; Saxe, 1990; Sternberg et al., 1998) (Tomlinson, Brighton, Hertberg, Callahan, Moon, Brimijoin, Conover, & Reynolds, 2003).

How does a teacher know the readiness level, interest, and learning profile or style of each learner? Each unit of learning should start with an assessment component. Progress is made at different rates so should be adjusted with informal authentic assessments daily. This can be accomplished through simple forms as exit tickets at the end of learning session, questioning techniques at the beginning of a learning session or teacher observations during a learning session (Brimijoin, 2002). These informal authentic assessments can provide reliable and valid information about student learning (Moon, Callahan, Brighton, Tomlinson, 2002). A formal assessment at the end of a unit of study or course is not the only time to assess what students know, understand, or are able to do. A consistent evaluation of student progress throughout a unit will give a teacher and student an overview of student progress and the support needed for deep understanding.

Summary

Using the framework of backward design with quality assessment as the "cornerstone of the design and teaching process", conceptual understanding, and differentiation should lead to deep understanding of subject matter and life long learning for all student.

Chapter Three

Methodology of the Study

Introduction

This chapter provides the hypothesis, student sample, and description, time frame of the project, and methods and procedures. The chapter provides a description of the data collection process related to this study's hypothesis.

Hypothesis

The hypothesis for this study focused on the use of backward design and differentiation to design a second grade social studies unit.

The action research project takes place over a three and one half week period from January-February 2006. The focus of the unit is on the environment, culture, and contributions of ancient China and Egypt. This topic comes from the Standards of Learning for the Commonwealth of Virginia in Social Science/History for second grade. The Virginia Department of Education has adopted the Stage 1 format of Understanding by Design (UbD) to define the Standards of Learning Curriculum Framework for Social Studies, K-12. A pacing guide has been developed by the school division where the study took place. This guide was established so all elementary schools in the school division teach the same state standard in the same time period. The pacing guide determined the length of the study.

Hypothesis-In a second grade social studies unit, students show an increase in understanding when backward design and differentiated instruction are implemented.

Null Hypothesis- In a second grade social studies unit, students do not show an increase in understanding when backward design and differentiated instruction are implemented.

Design

This three week unit on ancient China and ancient Egypt was taught by a student teacher. Her background included a Bachelors Degree with licensure in elementary education, grades Pre-K-6. Her training is based on complex, multifaceted curriculum design using backward design and differentiated instruction. She is in her fifth year of training to obtain her MAT in Differentiated Curriculum and Instruction.

The social studies unit focuses on the geography of ancient China and Egypt, which includes the elements of location, environment, culture, and adaptation. The students received a variety of instructional methods during this unit to gauge if their understanding could be affected by curriculum design and instructional strategies. The big idea and essential questions were posted (Appendix C, Tables 1) and the students were told that these would be pre-tested at the beginning of each section of the unit and post-tested at the end of each section of the unit. The first six days of the unit (ancient China), students received teacher centered, direct instructional methods. These methods included lecturing, teacher read materials, and silent reading by students, and teacher led group discussions, black lines masters and whole class reading.

For the next nine days the students were engaged in the second half of the unit (ancient Egypt) using the same big idea and essential questions and a

rubric was introduced to show how understandings would be assessed (Appendix C, Table 2). The unit was constructed using backward design and a variety of differentiated teaching strategies based on readiness, learning styles, and interests to group students. Some of the differentiated strategies that were used were a KWL chart, jigsaw grouping, partner reading with materials on the student's independent reading level, black line masters assigned by perceived ability, and a RAFT. Anchoring activities were used to accommodate students who completed their activity early. Some of the anchoring activities the student teacher provided were to trace pictures of Egypt to color and display on a bulletin board, read books about Egypt and/or China, extending activities from main activity, and cut and glue black line masters. Scaffolding was provided throughout the differentiated activities.

The student teacher explains how she starts her planning for a unit as follows: "The first thing I look at is the pacing guide to see what standard of learning is to be taught and what time frame I am working with. Next I establish my big idea and essential questions." The Virginia Department of Education has adopted the Stage 1 format of Understanding by Design to define the standards in the Standards of Learning Curriculum Framework for Social Studies, K-12. In the scope and sequence the state has "unpacked" the standard and established essential understandings, questions, knowledge, and skill associated with each standard. These "essentials" give a base to draw from when planning the unit (Appendix C, Table 1). Student answers to the essential questions about ancient China in a pre and post format will establish the baseline data needed for comparison.

Population Sample

This project was implemented from January 23, 2006-February 20, 2006 in an elementary school in middle to low class rural area. There are 55 second grade students participating in this study from the ages of 7 to 9 years old. This project included an ethnic background makeup of 38 White students, 13 Black students, 3 English speaking Hispanic students, and 1 English speaking Russian student. The gender ratio is 31 girls and 24 boys. Of this population of 55, 17 are reading at an acceptable second grade level, 20 students are reading above second grade level, and 11 are reading below an acceptable second grade level. The above grade level readers range from third to six grade level and the below grade level readers range from primer to first grade level.

Timeline

This is a three week unit that takes place in the months of January and February of 2006. The same information must be taught about both ancient China and Egypt. The first six days covered ancient China in a direct instruction format. Day seven through fifteen was planned with backward design and differentiated instruction with the study of ancient Egypt.

Data Collection

Prior to the beginning and at the end of each section of this unit the students completed an assessment composed of the essential questions. The teacher would read each question to the students and they would complete the written answer independently. To determine if students had an increase

in the understanding of the essential questions a rubric was used to score the assessments (Appendix C, Table 2&3) .

Methods and Procedure

The following methods and procedures were used in this three week unit about ancient China and Egypt. The chart shows whole class and differentiated components for each lesson. Each lesson is numbered to show the sequence of the procedure used. The first six days have no differentiated components since these lessons were used to collect baseline data through direct instruction. Differentiated components were added for lessons 7 through 15.

Lesson	Whole Class Components	Differentiated Components
Lesson 1 Pre-test & Introduction 1 class period	1. Pre-test: essential questions 2. Introduce ancient China: lecture about geography, land, and climate of the region. Black lines master independently completed by each student to show what was learned. This was not used by the teacher for further planning and no feedback was given when masters were returned to students.	
Lesson 2 Environment	1. Teacher lectures: environment of China and how people adjust to the environment. Teacher reads	

1 class period	information from black lines masters and discusses. Students color pictures. 2. Teacher gives each student a black lines master about silk worms and guides students to complete together.	
Lesson 3 Great Wall of China Characters and Symbols 1 class period	1. Teacher lectures: Great Wall of China. 2. Teacher gives each student a black lines master about Great Wall, reads information to students and guides students to complete together. 3. Teacher gives each student black lines masters of Chinese characters and symbols and a card with a word that students are to write using characters and symbols. 4. Students complete black lines master independently about The Great Wall of China to assess how well they listened to opening lecture.	
Lesson 4 Chinese New Year 1 class period	1. Teacher lectures: Chinese New Year. Teacher lists the important facts on overhead projector as presented in lecture. 2. Students are each given a black lines master: Chinese New Year, class reads passage together. Students complete master "fill in the blank" independently. 3. Each student is given a	

	black lines master of a Chinese lantern and they are to write a word using Chinese characters and symbols from prior lesson.	
Lesson 5 Chinese Inventions and Contributions 1 class period	1. Teacher lecture introduces inventions and contributions. 2. Students complete a black lines master to match word and invention independently. 3. Each student completes a black lines master of a Chinese calendar wheel. 4. Students start watching a video of a Chinese legend.	
Lesson 6 Complete Unit and Post-Assessment	1. Students finish watching video and discuss what they saw in the movie that they had learned in this unit. 2. Final assessment test and post-assessment of essential questions.	
Lesson 7 Introduction and Pre-Assessment 1 class period	1. A rubric introduced for scoring pre and post assessment. Students answer essential questions. 2. Teacher gives overview of the unit about ancient Egypt. 3. Whole group examination of pictures of geography of the United States. 4. Students find Egypt on classroom map and globes and color on individual map.	4. Scaffolding is given with this activity.
Lesson 8 Informal assessments &	1. Probing questions to review and assess understanding of prior	

Components of Geography 1 class period	lesson. 2. Students complete "K" & "W" of "What I Know, What I Want to Know, What I Learned" (KWL) chart. Charts are shared and posted on a classroom chart. Whole class discussion/share from reading and sharing groups.	2. Students work with partner of their choice to compete "K"&"W". Scaffolding provided. 3. Differentiated by reading readiness level. Students are given reading material to read and share with small group. Jigsaw groups by taking one from each group to form new groups to share what is read. Scaffolding and anchoring activities were provided.
Lesson 9 Compare and Contrast Different Civilization 1 class period	1. Teacher asks probing questions about climate, land, people of Egypt. 2. Teacher shows pictures from overhead projector of Egypt's geography. Students explain how pictures depict ancient Egypt. 4. Groups share posters. 5. Assessment of Egyptian geography.	3. Grouped by reading readiness levels to design a poster to compare and contrast ancient China and ancient Egypt. Scaffolding and anchoring activities were provided. 6. Outcome used for planning and feedback.
Lesson 10 Contributions of Pyramids & Mummies	1. Introduction through discussion. Teacher shows pictures and reads information to students about pyramids and	

1 class period	mummies. 3. Share and review what was learned.	2. Partnered by reading readiness level, given books or reading materials by assigned topic of pyramids or mummies. Partnered again to share/teach each other what was learned from reading. Scaffolding and anchoring activities were provided.
Lessons 11&12 Contributions of Pyramids & Mummies 2 class periods	1. Probing questions to review mummies and pyramids.	2. Differentiated by interest. Lesson 11-mummies, Lesson 12-pyramids. Group 1 draws mummies/pyramids, Group2 writes about mummies/pyramids, Group 3 makes mummy/pyramid. Scaffolding and anchoring activities were provided.
Lesson 13 Inventions 1 class period	1. Introduce inventions through probing questions and discussion. Students rotate through learning centers to write name in hieroglyphics, watch demonstration of water clock, oral review of ancient Egypt.	
Lesson 14 Final Assessment 1 class period	1. Review discussion by completing the "L" of the KWL chart.	2. Independent completion of a RAFT activity based on learning profile and Gardner's multiple intelligences (Appendix C, Table 4). A rubric is used to score. (Appendix C, Table 5)
Lesson 15 Post-assessment	1. Oral review of what was covered in unit of ancient Egypt. Students	

1 class period	independently complete the post-assessment of essential questions.	

Summary

This unit, as a whole, is difficult for students of this grade and age. So many of the concepts are abstract and they must be made relevant for the students to understand. The two sections of the same state standard are distinctly different in both planning and format for this unit. Both forms of planning and format covered all the essential understanding, questions, knowledge, and skills of the standard of learning. The second half of the unit was three days longer because lessons were based on on-going assessment and lessons were added where needed. The students showed great interest with both ancient China and Egypt. Black lines masters were used with both sections but the change came with the format of discussion/lecture that changed to probing questions, the reading materials were changed to the student's reading readiness level, and lessons were altered to accommodate learning styles and interests in the second half of the unit. One of the differentiated strategies that were used was tiered lessons so that all students had materials that were appropriately challenging. The classroom was arranged so that students had areas that were appropriate for whole-group, small-group, partner, and individual learning areas. Informal assessments were used to furnish feedback to plan further lessons. The same final assessment and scoring rubric was used to see if any increase of understanding could be identified.

Chapter Four

Research Findings

"Together, backward design and differentiation describe a comprehensive way of thinking about curriculum, assessment, and instruction, stemming from a shared understanding of what constitutes effective teaching and learning." (*Integrating Differentiated Instruction +Understanding by Design,* Carol Ann Tomlinson and Jay McTighe, 2006). There are definite steps that help with this goal of teaching and learning. The first step is to pre-assess the students for preferred learning styles and interests. The next step is to determine the desired results for the unit which is drawn from the state and/or national standards used by the school division. The desired results will be the goals, essential understandings, essential questions, and what students will know and be able to do. Once these are determined, it is necessary to establish what will be acceptable evidence that students have become experts. Now is the time for the learning plan to be set up to include the whole group, small group, and individual activities to develop expertise of all students. A pre-assessment is now administered to establish student prior knowledge and proficiency with the learning goals. Both the learning styles pre-assessment and the learning goals pre-assessment were used to plan for direct learning and differentiated lessons. This process compacts the learning time for students who need more intense learning for understanding and students who have already have a deep understanding of the learning goals will work with extension activities. Students who need more intense learning for understanding were not moved before that

understanding can be established. Progress is gauged by formal and informal assessment throughout the unit. This is established through performance tasks, student reflection, exit tickets, and review using probing questions. The information gathered from these assessments was used for further planning.

Unit Adjustments

The unit used for this research was planned and taught by a student teacher whose formal training had been based on the theories of Understanding by Design, backward design, and Differentiated Instruction. The writer acted as the observer and advisor for the design and research. There were many forms of assessment included throughout the differentiated component of the unit of study. On day ten the assessment information gathered, by sharing and reviewing what was learned (see chapter 3), showed that the students had a wide range of understanding of the lesson about pyramids and mummies and more learning activities were needed for deep understanding. When we reviewed the assessment and found such a wide range of understanding the student teacher and the writer decided that lessons needed to be added. The following two days of differentiated lessons were added to bring further understanding to the students. The students were grouped based on preferred learning style determined by having students take a "Modality (sense) Preference" survey. The following is what was added to further the essential understanding about ancient Egyptian contributions to the present world:

Day 11

Subject: Social Studies/History

Standard: Students will explain how the contributions of ancient Egypt influenced the present world.

Key Concept: Contributions

Generalization: Students will be able to write, draw, or produce a replica of a pyramid.

Background: The ancient Egyptians made contributions to the present world through the architecture of the pyramids. Mummification was a process used to preserve and prepare bodies for the afterlife. The purpose and use of pyramids as well as the mummification process tell us a lot about the ancient Egyptians beliefs and traditions, regarding death and the afterlife.

Tier I: Draw/design a visual representation of a pyramid inside and out.

Tier II: Fill out a facts and information sheet on pyramids.

Tier III: Follow directions to build a 3-dimentional pyramid.

Assessment: By looking at the completed products from the 3 different activities, the teacher will be able to assess the understanding of who, why, and how pyramids were built.

Day 12

Subject: Social Studies/History

Grade: Second

Standard: Students will explain how the contributions of ancient Egypt influenced the present world.

Key Concept: Contributions

Generalization: Students will be able to write, draw, or produce a replica of a mummy.

Background: The ancient Egyptians made contributions to the present world through the architecture of the pyramids. Mummification was a process used to preserve and prepare bodies for the afterlife. The purpose and use of pyramids as well as the mummification process to tell us a lot about the ancient Egyptians beliefs and traditions, regarding death and the afterlife.

Tier I: Draw a visual representation of the six steps to mummification.

Tier II: Write the six steps to mummification as you understand it.

Tier III: Follow directions to make a 3 dimensional replica of a mummy.

Assessment: By looking at the completed products from the 3 different activities, the teacher will be able to assess the understanding of whom, why, and how pyramids were built.

Scaffolding was provided for both days and with all activities. When students are given activities of their interest, the lesson leads to more production of product and/or process and deep understanding.

Quantitative and Qualitative

There were 55 students in the original test sample. The research took place in the month of January and February which is prime time for second graders to become sick. This is exactly what happened and the total number of students that were administered the pre and post test for both halves of the unit for first ancient China and second ancient Egypt condensed to only 42 students.

The statistical analysis that the writer ran to determine if the students showed growth in understanding was a 2-tailed T-test. The difference between the means scores of the pretest and posttest groups is shown in a minus which is a negative because the posttest mean is subtracted from the

pretest mean with the statistical program that the writer used. The writer ran the T-test for dependent means three different ways. The first T-test analysis was the pre and post test scores for the first section of the unit. The second T-test analysis showed the pre and post test of the second section of the unit. The third T-test analysis showed the post test for the first and second sections of the unit. The outcome of these three analyses is as follows:

The first T-test shows the data collected from the pre and post test of the essential questions of the first half of the unit of study which was about ancient China.

T-Test 1

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	VAR00001	5.7619	42	3.59410	.55458
	VAR00002	7.6905	42	5.17729	.79887

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	VAR00001 & VAR00002	42	.153	.333

Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
VAR00001 - VAR00002	-1.92857	5.83259	.89999	-3.74614	-.11101	-2.143	41	.03

Paired *t* test results

P value and statistical significance:

The two-tailed P value equals 0.038

By conventional criteria, this difference is considered to be very statistically significant.

Confidence interval:

The mean of Pretest 1 minus Posttest 1 equals -1.92

95% confidence interval of this difference: From -3.746 to -0.111

Intermediate values used in calculations:

t = -2.143

df = 41

standard error of difference = 0.899

Group	Pretest 1	Posttest 1
Mean	5.76	7.69
SD	3.59	5.17
SEM	0.55	0.79
N	42	42

The next T-test shows the data collected from the pre and post test of the essential questions of the second half of the unit of study which was about ancient Egypt.

T-Test 2

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	VAR00001	7.4524	42	3.22492	.49762
	VAR00002	21.2381	42	11.85236	1.82886

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	VAR00001 & VAR00002	42	.502	.001

Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
1 VAR00001 - VAR00002	-13.78571	10.60726	1.63674	-17.09117	-10.48026	-8.423	41	.00

Paired *t* test results

P value and statistical significance:

The two-tailed P value is less than 0.001

By conventional criteria, this difference is considered to be extremely statistically significant.

Confidence interval:

The mean of Pretest 2 minus Posttest 2 equals -13.7857

95% confidence interval of this difference: From -17.09 to -10.48

Intermediate values used in calculations:

t = 8.423

df = 41

standard error of difference = 1.636

Group	Pretest 2	Posttest 2
Mean	7.45	21.23
SD	3.22	11.85
SEM	0.50	1.82
N	42	42

The third T-test shows the data collected from the post tests of both parts of the unit, completed at the end of the first six days about ancient China and after the next nine days when the differentiated unit about ancient Egypt was completed.

T-Test 3

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	VAR00001	7.4524	42	3.22492	.49762
	VAR00002	21.2381	42	11.85236	1.82886

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	VAR00001 & VAR00002	42	.502	.001

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
1	VAR00001 - VAR00002	-13.78571	10.60726	1.63674	-17.09117	-10.48026	-8.423	41	.00

Paired *t* test results

P value and statistical significance:

The two-tailed P value is less than 0.001

By conventional criteria, this difference is considered to be extremely statistically significant.

Confidence interval:

The mean of Posttest1 minus Posttest 2 equals -13.00

95% confidence interval of this difference: From -17.09 to -10.48

Intermediate values used in calculations:

$t = 8.423$

df = 41

standard error of difference = 1.636

Group	Posttest 1	Posttest 2
Mean	7.45	21.23
SD	3.22	11.85
SEM	0.49	1.82
N	42	42

Results

The results of the first T-test showed that there was only a 1.9 increase in the mean score between the pretest (5.7) and post test (7.6) in the first part of the unit about ancient China. This portion was taught with a direct instruction format. The degrees of freedom were 41.

The results of the second T-test showed a more significant increase of 13.3 in the mean score between the pre and post test in the second part of the unit about ancient Egypt. This portion was planned with backward design and taught using differentiated instruction.

The results of the third T-test showed a slightly more significant outcome. The data used for this test was the post-test scores from the first and second parts of the unit. The outcome shows that the students had a 13.8 increase in the mean score. The outcome of this analysis shows a significant increase in the scores when comparing direct instruction strategies and backward designed curriculum, incorporating differentiated instructional strategies.

The school division of the research study administers 9-week assessments in the four core areas of English, Mathematics, Science, and Social Studies/History. The assessment consists of multiple choice questions that mirror the Standards of Learning test questions. The questions correlate to the standards that the pacing guide tells the grade level they are to teach for the 9-week segment of time. The pacing guide for the time frame of the research study included the standards covering ancient China, ancient Egypt, and famous Americans. The assessment report was in the same format with identification set up as SOL A (China), SOL B (Egypt), SOL C (famous Americans). There were 20 questions on the test with 51 students being

tested. The overall score for the 51 students was 86%, divided into scores of SOL A- 65%, SOL B-86%, and SOL C, also taught with backward design and differentiated instruction, 100%. This not an official research project, but I feel that this test shows a significant strength in understanding of the material planned with backward design of curriculum and taught with differentiated activities.

When observing the UbD, DI lessons, the writer noted the level of interest and attentiveness showed a significant increase. The classroom took on a much more organized atmosphere with few disruptions due to lack of interest or frustration with the undertaking of assignments. The overall attitude of the students showed the interest that is needed to achieve the understanding of an expert. The lessons were engaging to all students so the students remained on task at their own level of interest or readiness. The students moved from partner to partner or group to group with no problem with flexible grouping. The students often made comments about the class time going so quickly.

Summary

The research showed student understanding increased when backward design and differentiated instruction were implemented. The time period was short but effectively covered the material needed for student success. The results have encouraged me to continue with this curriculum development and implementation.

Chapter 5

Recommendations

The outcome of the research shows that students demonstrate more understanding of the topics of ancient Egypt than ancient China through the use of backward curriculum design and differentiated instruction. Teachers trained in this form of curriculum design and implementation can promote students understanding rather than simple recall of information. Lessons should be planned by means of engaging experiences using differentiated instructional strategies and aligned with desired learning outcomes to create a learning atmosphere that provides understanding for all students learning. Educators have known for years that students learn best in a variety of modalities or senses but educators continue to teach in whole group, direct teaching environments. Student learning can be maximized through targeting essential understandings and by teaching students according to their readiness level, interest, and learning style. To continue to teach whole classes at the same level with textbook coverage of content standards, is not teaching for growth in understanding.

My final recommendation is that it is time for us, as educators, to make the change that is needed to meet the needs of all students. Teachers can become more effective when they design curricula to meet standards, as well as the needs of their students. Change is difficult for everyone but worth the effort when you see the student growth.

Threats

This study combined Understanding by Design and Differentiated Instruction. Independently the two theories are supported with prior research. The major threat to this study is that the rubric used to score the pre and post test of essential questions was not field tested. . The rubric used to score the pre and post test was based on the first three facets of understanding: explain, interpret, and apply from Wiggins and McTighe. The writer did use the performance verbs published by Jay McTighe and Grant Wiggins in *Understanding by Design Professional Development Workbook* when planning the rubric (p.161). The writer also used the Wiggins and McTighe rubric for the six facets of understanding for a reference to plan the rubric used in the study. Both the writer and student teacher used the rubric to score the pre and post test assessments to establish interrater reliability. The tests were scored by number not name and prior scores were not accessible when the second score was calculated. The scorers were very close in range, the same or within one or two points.

Second, the student teacher who taught the unit had little experience in direct instruction. She was aware of this problem and conferred with the writer regarding her lessons prior to the presentation to the students. She expressed concern with reference to not being able to meet the needs of all the students through direct instruction.

Third, the research group became significantly smaller than originally planned. Instead of the original 55 students planned for, the final number was only 42, a rather high mortality rate. The time frame was short, only three weeks. These findings are limited to the population included in the

study and should not be generalized to a larger population. It does, however, show me that the strategies worked in this study for growth in understanding and the writer will continue to use this form of teaching and learning.

Internal validity is hard to control in the actual classroom environment, but the student teacher and the writer kept validity in mind when planning and undertaking the unit of study. Because we had to make up snow days, the timeline changed so the whole unit could be taught by the student teacher who has had extensive training in the methods of UbD and DI. The validity threats were eliminated by having the student teacher plan and instruct both halves of the unit of study.

The threat of readability of the pre and post test was eliminated by having the student teacher read the test questions to the subjects. If the scorer had any problem reading the invented spelling, the subject would read their answer to the scorer. Learning inventories were used with differentiated lessons to group the subjects by readiness, interests, and learning styles.

Future Research

Future research is needed to show reliability in the outcome of this study. The writer plans on replicating the same study over the next few years to compare the outcome to see if the growth in understanding is consistent over time. A field tested rubric will would strengthen the reliability of these findings.

Next, more classroom research is needed in other grade levels using Understanding by Design, backward design, and Differentiated Instruction strategies.

When the study is replicated, the writer would like to include comparisons by race, gender, readiness, and culture. This design would provide more information about the influence of backward design and differentiation on these demographic categories.

The writer would also like to increase this study's sample size by having other second grade classrooms participate. A larger sample size would increase the validity of the experiment and add greater importance for educators to meet the needs of all students through backward design curricula.

A Final Thought

Accountability is at the forefront of the educational environment at the present time. Students can not carry this weight alone; educators need to share the load. Reaching higher standards of accountability can not be accomplished without a clear departure from coverage of material through direct instruction.

Appendix A Table 1

Rubric for the Six Facets of Understanding

Explanation	**Interpretation**	**Application**	**Perspective**	**Empathy**	**Self-Knowledge**
Sophisticated: an unusually thorough, elegant, and inventive account (model, theory, or explanation); fully supported, verified, and justified; deep and broad: goes well beyond the information given.	*Profound*: a powerful and illuminating interpretation and analysis of the importance/meaning/significance; tells a rich and insightful story; provides a rich history or context; sees deeply and incisively any ironies in the different interpretations.	*Masterful*: fluent, flexible, and efficient; able to use knowledge and skill and adjust understandings well in novel, diverse, and difficult contexts.	*Insightful*: a penetrating and novel viewpoint; effectively critiques and encompasses other plausible perspectives; takes a long and dispassionate, critical view of the issues involved.	*Mature*: disposed and able to see and feel what others see and feel; unusually open to and willing to seek out the odd, alien, or different,	*Wise*: deeply aware of the boundaries of one's own and others' understanding; able to recognize his prejudices and projections; has integrity – able and willing to act on what one understands.
In-depth: an atypical and revealing account, going beyond what is obvious or what was explicitly taught; makes subtle connections; well supported by argument and evidence; novel thinking displayed.	*Revealing*: a nuanced interpretation and analysis of the importance/meaning/significance; tells an insightful story; provides a telling history or context; sees subtle differences, levels, and ironies in diverse interpretations.	*Skilled*: competent in using knowledge and skill and adapting understanding in a variety of appropriate and demanding contexts.	*Thorough*: a revealing and coordinated critical view; makes own view more plausible by considering the plausibility of other perspectives; makes apt criticisms, discriminations, and qualifications.	*Sensitive*: disposed to see and feel what others see and feel; open to the unfamiliar and different.	*Circumspect*: aware of one's ignorance and that of others; aware of one's prejudices; knows the strengths and limits of one's understanding.
Developed: an account that reflects some in-depth and personalized ideas; the student is making the work her own, going beyond the given – there is supported theory here, but insufficient or inadequate argument or evidence.	*Perspective*: a helpful interpretation or analysis of the importance/meaning/significance; tells a clear and instructive story; provides a useful history or context; sees different levels of interpretation.	*Able*. able to perform well with knowledge and skill in a few key contexts, with a limited repertoire, flexibility, or adaptability to diverse contexts.	*Considered*: a reasonably critical and comprehensive look at all the points of view in the context of one's own; makes clear that there is plausibility to other points of view.	*Aware*. knows and feels what others see and feel differently; somewhat able to empathize with others; has difficulty making sense of odd or alien views.	*Thoughtful*: generally aware of what is and is not understood; aware of how prejudice and projection can occur without awareness and shape one's views.
Intuitive: an incomplete account but with apt and insightful ideas; extends and deepens some of what was learned; some "reading between the lines": account has limited support/argument/data or sweeping generalizations	*Interpreted*: a plausible interpretation or analysis of the importance/meaning/significance; makes sense of a story; provides history and context.	*Apprentice*: relies on a limited repertoire of routines; able to perform well in familiar or simple contexts, with perhaps some needed coaching; limited use of personal judgment and responsiveness to	*Aware*: knows of different points of view and somewhat able to place own view in perspective, but weakness in considering worth of each perspective,	*Developing*: has some capacity and self-discipline to "walk in another's shoes" but is still primarily limited to one's own reactions	*Unreflective*: generally unaware of one's specific ignorance; generally unaware of how subjective prejudgments color understandings.

There is a theory, but one with limited testing and evidence.		specifics or feedback/situation	especially one's own; uncritical about tacit assumptions.	and attitudes; puzzled or put out by different feelings or attitudes	
Novice: a superficial account; more descriptive than analytical or creative; a fragmentary or sketchy account of facts/ideas or glib generalizations; a black-and-white account; less a theory than an unexamined hunch or borrowed idea.	*Literal*: a simplistic or superficial reading; mechanical translation, a decoding with little or no interpretation; no sense of wider importance or significance; a restatement of what was taught or read.	*Novice*: can perform only with coaching or relies on highly scripted, singular "plug-in" (algorithmic and mechanical) skills, procedures, or approaches.	*Uncritical*: unaware of differing points of view, prone to overlook or ignore other perspectives; has difficulty imagining other ways of seeing things; prone to egocentric argument and personal criticisms.	*Egocentric*: has little or no empathy beyond intellectual awareness of others; sees things through own ideas and feelings, ignores or is threatened or puzzled by different feelings, attitudes, or views.	*Innocent*: completely unaware of the bounds of one's understanding and of the role of projection and prejudice in opinions and attempts to understand.

(From: Wiggins and McTighe - www.ubdexchange.org/)

Appendix B Table 1

Stages in the Backward Design Process

Identify desired results.

Determine acceptable evidence.

Plan learning experiences and instruction.

We must ask...

What would we accept as evidence that students have attained the desired understandings and proficiencies - BEFORE - proceeding to plan teaching and learning experiences?

Appendix B Table 2

Quiz and Test Items

These are simple, content-focused questions. They

- Assess for factual information, concepts, and discrete skill.
- Use selected-response or short-answer formats.
- Are convergent—typically they have a single, best answer.
- May be easily scored using an answer key (or machine scoring).
- Are typically secure (not known in advance).

Academic Prompt

These are open-ended questions or problems that require the student to think critically, not just recall knowledge, and then to prepare a response, product, or performance. They

- Require constructed responses under school or exam conditions.
- Are open. There is not a single, best answer or a best strategy for answering or solving them.
- Often are ill-structured, requiring the development of a strategy.
- Involve analysis, synthesis, or evaluation.
- Typically require and explanation or defense of the answer given or methods used.
- Require judgment-based scoring based on criteria and performance standards.
- May or may not be secure.

Performance Tasks and Projects

As complex challenges that mirror the issues and problems faced by adults, they are authentic. Ranging in length from sort-term tasks to long-term, multistage projects, they require a production or performance. They differ from prompts because they

- Feature a setting that is real or simulated: one that involves the kind of constraints, background noise, incentives, and opportunities and adult would find in a similar situation.
- Typically require the student to address and identified audience.
- Are based on a specific purpose that relates to the audience.
- Allow the student greater opportunity to personalize the task.
- Are not secure. Task, criteria, and standards are known in advance and guide the student's work.

(*Understanding by Design* by Grant Wiggins and Jay McTighe,1998, p. 14)

Appendix B Table 3

The Big Picture of a Design Approach

Key Design Questions	**Design Considerations**	**Filters (Design Criteria)**	**What the Final Design Accomplishes**
Stage 1. What is worthy and requiring of understanding?	National standards State standards. District standards. Regional topic opportunities. Teacher expertise and interest.	Enduring Ideas. Opportunities for authentic, discipline-based work. Uncoverage. Engaging	Unit framed around enduring understanding and essential questions.
Stage 2. What is evidence of understanding?	Six facets of understanding. Continuum of assessment types.	Valid. Reliable. Sufficient. Authentic work. Feasible. Student friendly.	Unit anchored in credible and educationally vital evidence of the desired understanding s.
Stage 3. What learning experiences and teaching promote understanding, interest, and excellence?	Research-based repertoire of learning and teaching strategies. Essential and enabling knowledge and skill.	WHERE Where is it going? Hook the students. Explore and equip. Rethink and revise. Exhibit and evaluate.	Coherent learning experiences and teaching that will evoke and develop the desired understanding, promote interest, and make excellent performance more likely.

(Understanding by Design by Grant Wiggins and Jay McTighe, 1998, p. 18)

Appendix C Table 1

Commonwealth of Virginia Standards

The specific Standards of Learning to be taught at this time are as follows: Social Science/History standard 2.1-The students will explain how the contributions of ancient China and Egypt have influenced the present world in terms of architecture, inventions, the calendar, and written language.

Essential Understandings: Ancient people made contributions that affect the present world.

Essential Questions: What contributions did the people of ancient China and Egypt make to the development of written language? What inventions came from ancient China and Egypt? What examples of architecture from ancient China and Egypt are still present today?

Essential Knowledge: Terms to know-Ancient: Long, long ago, Architecture: The design of buildings, and Contributions: The act of giving or doing something.

Many inventions of ancient China and Egypt are still used today.

Essential Skills: Locate and use information from print and non-print sources. Gather, classify, and interpret information. Use resource materials. Collect, organize, and record information.

Social Science/History standard 2.4-The students will develop map skills by

a) locating China and Egypt on world maps;

c) comparing the climate, land, and plant life of these regions;

d) describing how people in these regions adapt to their environment.

Essential Understandings: People adapt to their environment in different ways.

Essential Questions: Where are China and Egypt located on a world map? How are the climates, land, and plant life of these regions similar and different? How did the ancient Chinese and Egyptians adapt to their environment?

Essential Knowledge: Terms to know-Climate: The kind of weather an area has over a long period of time. Land: The shape of the land's surface. Environment: Surroundings.

China is located in Asia. Egypt is located in Africa.

Ways people adapted to their environment: The ancient Chinese fished, farmed, and irrigated the land. The ancient Egyptians farmed and irrigated the land near the Nile River.

Essential Skills: Locate regions on maps and globes. Locate and use information from print and non-print sources. Use resource material. Gather, classify, and interpret information.

Appendix C, Table 2

Essential Understanding: Diverse Cultures and Environments

Essential Questions:

1. How do we know where a country is located in the world?
2. How did the ancient Chinese/Egypt adapt to the environment of their region?
3. How are the climate, land, and plant life of their region similar and different to ours in the U.S.?
4. How does *where* you live affect *how* you live?
5. How have the contributions of ancient China/Egypt influenced the present world in terms of architecture, inventions, the calendar, and written language?

Appendix C Table 3

Name____________________________ Date________________

Rubric

Criteria	4	3	2	1
Explanation	Thorough accurate and coherent explanation of the topic.	Fairly thorough and reasonably accurate explanation.	Partial explanation of topic given with key elements missing.	Very little explanation of topic with no key elements.
Interpretation	Response draws logical, clear conclusions which are somewhat clear.	Response draws some conclusions but brief, somewhat lacking in clarity or have minor errors in logic.	Response draws at least one conclusion but it is sparse or confusing.	Response draws no conclusion.
Application	Response shows a complete understanding of the question.	Response shows substantial understanding of the questions.	Response shows some understanding of the questions.	Response shows a complete lack of under-standing of the question.

Appendix C, Table 4

Name______________________________ Date_____________________

Pretend that you are a historian and for a living you write books for children to read and learn about different ancient civilizations. Right now you are writing a book about Ancient Egypt.

Your assignment is to write a chapter for your book that talks about the different **inventions** and **contributions** that the ancient Egyptians made.

Remember back to yesterday when we talked about the different things that the ancient Egyptians invented. Explain **what** the different inventions were and **why** they are important.

Name______________________________ Date_____________________

Pretend you are a Pharaoh who has just died and is being mummified by Priests. You do not know what mummification is so you are very confused and do not understand what the Priests are doing to your body.

Your assignment is to write about what they are doing to you, like you would write in a diary or journal. Write about all the different things they are doing to your body and describe what it looks like.

Remember back to the **six steps of mummification** that we discussed in class.

Name________________________________ Date___________________

Pretend that you are a farmer in ancient Egypt who has a wife and two children. Your oldest son asked you to tell him about farming. He wants to know **what** to grow, **when** you grow it, and **how** you grow it.

Your assignment is to answer his questions about farming in ancient Egypt. Remember to tell him about the **land**, **Nile River**, and **climate** and how they affect farming.

Appendix D, Table 5

Name______________________________ Date__________________

	☺ ☺ ☺	☺ ☺	☺
Did you follow the assignment?	It is clear who you were pretending to be and what you wrote about.	It is kind of clear who you were pretending to be and what you wrote about.	It is unclear who you were pretending to be and what you wrote about.
Did you include the facts and information we talked about?	Used lots of good information and facts that we studied about ancient Egypt.	Used some but not much of the information and facts that we studied about ancient Egypt.	Used no facts or information that we studied about ancient Egypt.
Did you use correct grammar and spelling?	Made only 1 or 2 spelling or grammar mistakes. Handwriting was neat.	Made 3-5 spelling or grammar mistakes. Handwriting was okay.	Made more than 5 spelling or grammar mistakes. Handwriting was messy.

Try to find a color printer that will print the URL's clearly!

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